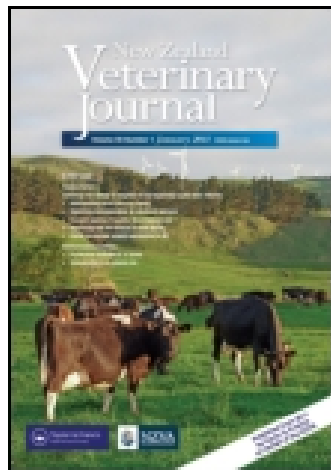


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Publisher: Taylor & Francis

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New Zealand Veterinary Journal

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tnzv20>

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Published online: 23 Feb 2011.

To cite this article: C. Drake B.Sc., A.B. Grant B.Sc. Ph.D. & W.J. Hartley M.R.C.V.S. (1960) Selenium and animal health, New Zealand Veterinary Journal, 8:1, 7-10, DOI: [10.1080/00480169.1960.33364](https://doi.org/10.1080/00480169.1960.33364)

To link to this article: <http://dx.doi.org/10.1080/00480169.1960.33364>

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SELENIUM AND ANIMAL HEALTH

Part 2: The Effect of Selenium on Unthrifty Weaned Lambs

C. DRAKE, A. B. GRANT, AND W. J. HARTLEY*

UNTHRIFTINESS in both weaned and unweaned lambs is probably the most important cause of economic loss in the New Zealand sheep industry. Although some of this unthriftiness is directly associated with under-feeding, most of it occurs in lambs grazing on abundant pasture which is presumed to be highly nutritious. Known causes of unthriftiness in lambs on this kind of pasture are cobalt deficiency and internal parasitism. However, it is commonly accepted that these account for only a part of the unthriftiness experienced.

Clarke and Filmer (1958) have described as "hogget ill-thrift" an entity which commonly occurs in the North Island in the early autumn months in weaned lambs grazing on lush pasture and which appears to be associated with unattractiveness of the herbage. Stuart *et al.* (1957) have discussed pre-weaning and post-weaning unthriftiness of lambs in Canterbury.

McLean *et al.* (1959) reported a weight response to oral and subcutaneous administration of selenium, both in unweaned and weaned lambs on the Lincoln College property and on other farms in Canterbury. In some of the flocks, white muscle disease had occurred earlier. Haughey (pers. comm.), independently of the Lincoln College workers, also obtained a significant weight response to selenium in unweaned lambs on a property in Canterbury.

The purpose of this paper is to summarize results from selenium trials carried out on unthrifty weaned lambs in certain North Island areas, and to report briefly on similar trials in the South Island.

Experimental Methods and Results

TRIALS IN THE ROTORUA-TAUPO AREA

Field reports from the Rotorua-Taupo district in December, 1958, indicated that unthriftiness and mortality in lambs were reaching serious proportions on many of the newly-settled farms situated on pumice soils. On the farms concerned, some of which had earlier experienced white muscle disease, ample high-quality lush clover-dominant herbage was available and, as far as could be ascertained, cobalt deficiency and parasitism had been eliminated as major causes of the unthriftiness (Jolly, pers. comm.).

Eight badly-affected farms on which up to 40 per cent. of the lambs had been lost since marking were selected for trials irrespective of whether white muscle disease had been found. Trials were started in January, 1959. At this time, the lambs were about five months old and the average weights of those selected for trials ranged from 34 to 49 lb. On each property, lambs were identified with numbered ear tags and divided into two groups of equal numbers. Each group contained from 20 to 36 animals, depending on the number of lambs available.

At the start of each experiment, one group was orally dosed with 1 ml of an aqueous solution of sodium selenate equivalent to 5 mg of selenium, and this was repeated at two weeks and at six weeks. The other group received no treatment and served as a control. All lambs were weighed at the commencement, two weeks later, and then at monthly intervals until the trial was terminated 10 weeks after its inception.

The overall mortality in the control groups was 27 per cent., whereas that in the selenium-dosed groups was 8 per cent. Although the overall death rate was reduced by selenium therapy to a highly significant degree ($\chi^2 = 10.2$), the results still

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TABLE 1: EFFECT OF SELENIUM ON LAMB UNTHRIFTINESS (ROTORUA-TAUPO)

Farm	Location	No. of Lambs per Group	Number of Deaths		Av. Weight Gain (lb.)*	
			Control Group	Selenium Group	Control Group	Selenium Group
1	Rerewhakaaitu	25	13	8	5.9	11.1†
2	Reporoa	25	5	1	21.8	29.6†
3	Reporoa	25	15	2†	4.8	15.6†
4	Broadlands	25	3	1	14.1	25.1†
5	Wairakei	21	2	2	19.2	22.3
6	Wairakei	20	8	1‡	10.3	14.5‡
7	Wairakei	36	5	1	12.8	20.7†
8	Wairakei	24	4	0	3.7	17.8†
Totals		201	55	16		

*Survivors at the end of trials.

†Difference in favour of selenium treatment significant at 1 per cent. level.

‡Difference in favour of selenium treatment significant at 5 per cent. level.

show a high mortality (16) in the treated groups. It must be emphasized, however, that many of the lambs chosen at the commencement of these trials were for the most part in extremely poor condition and that almost all deaths in the selenium-treated groups occurred within the first fortnight of the trial. Thereafter, they practically ceased, while mortalities in the control animals continued throughout the trial period.

The average weight gains reported are those of animals which survived, and, since losses in weight of those lambs which died during the trial period have been ignored, the figures for the most part are biased strongly in favour of the controls. In spite of this fact, there were, in most cases, still appreciable differences between groups in favour of selenium treatment. However, a more realistic picture in terms of loss of production from unthriftiness in these trials is illustrated in Fig. 1. This depicts the change in total liveweight of the selenium-dosed lambs in all eight trials as compared with that of the controls. In this graph, deaths are taken into account, being considered as losses in total liveweight.

As a result of the high mortalities, the undosed groups suffered a loss in total liveweight of 178 lb., whereas the treated groups gained 3,150 lb.

OTHER NORTH ISLAND TRIALS

The effect of selenium was also investigated in other widely separated districts in the southern half of the North Island where, during the summer and autumn of 1959, the incidence of lamb unthriftiness was moderately high. Twenty-two trials, similar to those already described, were carried out on lambs of both sexes from 5 to 8 months of age. On none of these farms had out-

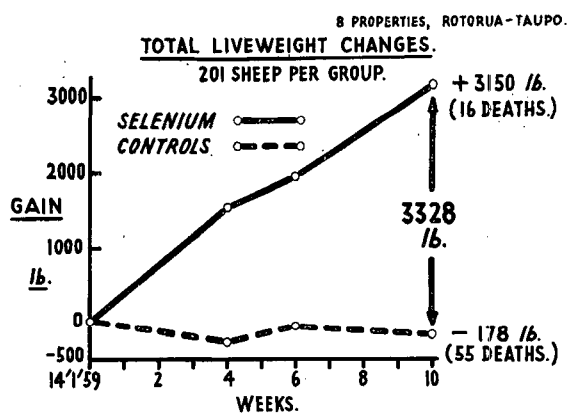


Fig. 1: Change in total liveweight of selenium-dosed lambs in eight trials, compared with that of controls.

breaks of white muscle disease been reported. The results are summarized in Table 2.

In all flocks in which mortalities were high, the number of deaths was reduced by selenium administration, and the overall reduction from 12.1 per cent. of the 680 control animals to 3.7 per cent. of the same number of those treated was statistically highly significant ($\chi^2 = 29.3$).

There was a statistically significant weight gain response to selenium on 15 of these properties and small differences in favour of selenium on the other 7.

In addition to the above trials, three others were carried out on properties experiencing outbreaks of the autumn-flush type of hogget ill-thrift described by Clarke and Filmer (1958). These were conducted in the Gisborne area by the Gisborne Veterinary Club and by D. P. Sinclair, of the

Manutuke Research Station, and in the Hamilton area by E. A. Clarke, of the Ruakura Animal Research Station. Reports from these workers (pers. comm.) have indicated that this type of ill-thrift is not controlled by selenium.

SOUTH ISLAND TRIALS

There was a relatively low incidence of unthriftiness in lambs and hoggets in the South Island during the summer and autumn of 1959, and there were no reports of heavy mortalities. However, selenium trials on unthrifty lambs were carried out by Government veterinarians, livestock instructors, and the Ashburton Veterinary Club on more than twenty properties in Canterbury and Otago. White muscle disease had previously occurred in lambs on some of the trial farms. The trials were carried out in a similar

TABLE 2: Effect of Selenium on Lamb Unthriftiness (22 Trials).

Farm	Location	Date Trial Commenced	Duration (weeks)	No. of Sheep per Group	No. of Deaths		Av. Weight Gain (lb.)*	
					Control Group	Selenium Group	Control Group	Selenium Group
9	Kinloch	27/3/59	9	25	14	3‡	15.9	21.6‡
10	Hunterville	28/2/59	4	23	0	0	7.7	8.9
11	Hunterville	28/2/59	4	27	0	0	10.0	10.4
12	Bulls	13/3/59	12	25	8	0‡	2.1	12.2‡
13	Bulls	14/4/59	10	19	3	0	9.3	17.7‡
14	Levin	9/3/59	8	30	1	1	15.1	18.0‡
15	Manakau	14/3/59	12	30	6	2	14.6	23.6‡
16	Manakau	26/3/59	8	25	1	1	6.8	9.0‡
17	Ohau	9/3/59	8	49	10	5	3.0	6.5‡
18	Waikanae	13/1/59	7	20	3	1	4.4	8.7‡
19	Kaitoke	24/3/59	6	20	3	3	5.0	7.1
20	Masterton	21/2/59	4	52	2	1	7.3	9.1‡
21	Masterton	21/2/59	4	43	0	1	7.0	9.1‡
22	Masterton	21/2/59	4	25	1	0	5.0	6.4
23	Masterton	21/2/59	4	29	0	0	0.9	2.2
24	Masterton	21/2/59	4	76	1	1	3.4	4.0
25	Carterton	29/12/58	12	25	6	2	4.3	8.1‡
26	Greytown	24/2/59	13	30	5	1	20.5	26.3‡
27	Featherston	17/3/59	7	25	1	2	12.2	17.5‡
28	Pirinoa	3/2/59	17	25	11	0‡	7.8	17.9‡
29	Pirinoa	10/3/59	4	34	0	0	7.4	8.0
30	Pirinoa	10/3/59	6	23	6	1	6.4	9.8‡
Totals				680	82	25		

*Survivors at the end of the trial.

‡Difference in favour of selenium treatment significant at 1 per cent. level.

‡Difference in favour of selenium treatment significant at 5 per cent. level.

manner to those described above, in lambs of mixed sexes 5 to 8 months old.

The results obtained from these trials were not as spectacular as some of those seen in the North Island. However, on the majority of properties, there was an average increased weight gain of from 2 to 7 lb. in favour of the selenium-dosed lambs during a three-month period.

Discussion

In all trials reported in Tables 1 and 2, there was an apparent growth rate response to selenium. Although in some this was small or not statistically significant, it must be borne in mind that most of the trials were started after the worst period of unthriftiness had apparently passed.

The average weight gain of selenium-treated lambs on the 30 farms varied widely from 0.6 to 3.0 lb per week. It is not possible to assess the extent to which the apparently poor growth rate in many of the selenium-treated groups was due to other growth-retarding factors. A period of feed shortage did occur on some properties during the trials and, on others, subsidiary trial groups receiving cobalt "bullets" or fine particle phenothiazine responded to these treatments in varying degrees.

Optimal levels and frequency of selenium administration have not yet been definitely established, while the possibility of applying selenium as a topdressing to pasture is still in an exploratory stage. Investigation of these aspects of the

problem, and a more detailed survey of the distribution of the type of lamb unthriftiness which will respond to selenium, are planned for the coming season. Meanwhile, the results reported here, together with those of McLean *et al.* (1959), serve to indicate that selenium supplementation is an important factor in the control of one form of unthriftiness which, at least in some seasons, may be widespread throughout New Zealand.

Summary

Administration of selenium to unthrifty weaned lambs has, in most cases, given significant results. Weight gains have been accelerated and, in the more severely affected flocks, mortalities have been markedly reduced.

Acknowledgements

The writers wish to express their appreciation to the farmers on whose properties these trials were carried out. The assistance of veterinary surgeons and livestock instructors who helped with the dosing and weighing of lambs is also gratefully acknowledged.

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